STATUS OF STOLONIFEROUS PUSSYTOES *(Antennaria flagellaris)* IN BRITISH COLUMBIA

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DISCLAIMER

"In cases where a Wildlife Working Report or Bulletin is also a species' status report, it may contain a status recommendation from the author. The Province, in consultation with experts, will determine the official conservation status and consider official legal designation. The data contained in the status report will be considered during those processes."

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EXECUTIVE SUMMARY

Species information

Antennaria flagellaris (A. Gray) A. Gray is a member of a genus of approximately 35 species found mainly of North America but also found in South America. Fifteen species occur in British Columbia and approximately 18 species in Canada. *A. flagellaris* was first recorded in Canada in 1998.

A. flagellaris is a stoloniferous, short-lived perennial from a fibrous root. The stolons are up to 10 cm long and the few central flowering stems are up to 3.5 cm tall. The numerous basal leaves and the few stem leaves are linear to linear-oblanceolate, silky woolly-hairy and 1 to 3 cm long. The flower heads are terminal with involucres of two types. Female involucres are 7- to 13-mm tall bracts, tinged brown or reddish-brown, thinly woolly-hairy below. The male involucres are 4- to 7-mm tall translucent bracts, brownish at the tips. The female flowers are longer than the male flowers. The achenes are elliptic, warty, and 2 to 3 mm long with a 6- to 8-mm tall pappus of white, hairlike bristles.

Distribution

In Canada, *A. flagellaris* is known only from the Similkameen River valley, south of Princeton in southwestern British Columbia. *A. flagellaris* ranges from southwestern British Columbia, south in the western United States to Idaho, Wyoming, Nevada, and California.

Habitat

A. flagellaris occurs in the southern interior of British Columbia along the Similkameen River valley in the lower montane zone in the Interior Douglas-fir biogeoclimatic zone. Climatic conditions in this region include hot, dry summers, a fairly long growing season, and cool winters. The *A. flagellaris* populations occur in calcareous, gravelly-clay soils or gravelly sands. The sites are characterized by a unique hydrology. The slopes, which are moderate (20 to 30 percent) with open southerly aspects, are eroded, unstable, and characterized by ephemeral seepage. These moist microsites are saturated by underground water in the winter and dry up in the summer.

Vegetation in the vicinity of the *A. flagellaris* sites is characterized by *Artemisia tridentata* (big sagebrush) shrub/grassland with scattered *Pinus ponderosa* (ponderosa pine) and *Pseudotsuga menziesii* (Douglas-fir). Associates include *Eriogonum ovalifolium* var. *nivale* (cushion buckwheat), *E. heracleoides* var. *angustifolium* (parsnip-flowered buckwheat), *Arenaria capillaris* ssp. *americana* (thread-leaved sandwort), *Elymus trachycaulus* (slender wheatgrass), *Danthonia unispicata* (one-spike oatgrass), *Ericameria nauseosus* var. *speciosa* (common rabbit-brush), and *Erigeron compositus* var. *glabratus* (cut-leaved daisy). Non-native species were not present.

Biology

Little information is available on the biology of *A. flagellaris* in British Columbia. Only basic reproductive facts have been compiled on the species.

A. flagellaris is a short-lived perennial, dioecious (male and female structures on separate plants), and wind-pollinated. Fruits are achenes, which contain a single seed and numerous hair-like bristles when mature that facilitate wind dispersal. Seeds are produced sexually by out-crossing. This species also reproduces vegetatively by producing stolons that terminate in plantlets.

Population sizes and trends

Three recently surveyed populations of *A. flagellaris* occur in the Similkameen River valley, west of Princeton, British Columbia. These populations occur over a distance of 3.2 km and range in size from 3 or 4 m^2 to 2100 m^2 and in numbers from 50 to approximately 1 400 000 ± 100 000 plants.

Limiting factors and threats

The greatest threat to populations of *A. flagellaris* are road or housing developments. Any developments that even slightly change groundwater levels could be devastating to this taxon. Secondary threats are weed control measures and off-road recreational vehicle use.

Special significance of the species

The calcareous clay seepage slopes where *A. flagellaris* occurs are unique in the Princeton area. In addition, they are not invaded by introductions, which result in a relatively pristine habitat. Furthermore, the populations are unique in that they are at the northern extent of their geographic range. Peripheral populations are often genetically and morphologically divergent from central populations and may have an evolutionary and ecological significance important to the species.

Existing protection or other status designations

Provincially, *A. flagellaris* has been ranked by the Conservation Data Centre as S1 and appears on the British Columbia Ministry of Sustainable Resource Management red list, the most critical rank. Currently no specific endangered species legislation is in place for the protection of vascular plants in British Columbia that have been given this critical rank. The populations of *A. flagellaris* in British Columbia, however, may be afforded some protection against certain types of property development because they occur on two private properties which fall within the Agricultural Land Reserve, where primary use is agriculture. Intensive uses are not prohibited and could be inconsistent with the habitat requirements of *A. flagellaris*. As a result, in the absence of active stewardship, populations of rare plants on these private lands are not secure.

Summary of status report

Only three extant populations of *A. flagellaris* occur along a 3.2-km stretch of highway south of Princeton in British Columbia. Suitable habitats for *A. flagellaris* are extremely rare in Canada and are restricted to the Princeton area. Opportunities for colonization are extremely limited. Road-building, housing developments, and recreational off-road vehicle use threaten the continued persistence of this species in Canada. The populations occur on private lands; in the absence of federal or provincial rare species legislation or active stewardship, these populations are not secure. Finally, the populations of *A. flagellaris* in British Columbia are at the northern extent of their range and may represent populations that are genetically distinct and important for the long-term survival and evolution of the species.

TABLE OF CONTENTS

SPECIES INFORMATION 1
- Name and Classification 1
- Description 1

DISTRIBUTION 1
- Global Range 1
- Canadian Range 1

HABITAT 1
- Habitat Requirements 1
- Trends 3
- Protection/Ownership 3

BIOLOGY 3
- General 3
- Reproduction 3
- Survival 3
- Physiology 3
- Movements/Dispersal 3
- Nutrition and Interspecific Interactions 4
- Behaviour/Adaptability 4

POPULATION SIZES AND TRENDS 4
LIMITING FACTORS AND TRENDS 4
SPECIAL SIGNIFICANCE OF THE SPECIES 5
EXISTING PROTECTION OR OTHER STATUS 5
- International Status 5
- National and Provincial Status 5

SUMMARY OF STATUS REPORT 5
LITERATURE CITED 5
COLLECTIONS EXAMINED 6

LIST OF TABLES

Table 1. Summary of populations and associated vascular plant species 3
Table 2. Locations and population sizes for *Antennaria flagellaris* in Princeton, British Columbia 4

LIST OF FIGURES

Figure 1. Illustration of *Antennaria flagellaris* 1
Figure 2. Distribution of *Antennaria flagellaris* in North America 2
Figure 3. Distribution of *Antennaria flagellaris* in British Columbia 2

SPECIES INFORMATION

Name and Classification

Antennaria flagellaris (A. Gray) A. Gray[1]
Antennaria dimorpha var. *flagellaris* A. Gray
Stoloniferous Pussytoes
Asteraceae (Compositae) Sunflower family
Angiosperm

Description

Antennaria flagellaris (A. Gray) A. Gray is a member of a genus of approximately 35 species mainly found in North America. but also found in South America (Cronquist 1994). The genus *Antennaria* belongs to the Inuleae tribe of the Asteraceae family. *A. flagellaris* has long been known for its taxonomic complexity, due to the existence of numerous apomictic clones that have been recognized as distinct species.

Fifteen species occur in British Columbia (Douglas 1998) and approximately 18 in Canada (Kartesz 1999). *A. flagellaris* was first recorded in Canada by Douglas *et al.* (1998a).

A. flagellaris is a stoloniferous short-lived perennial from a fibrous root (Douglas 1998; Figure 1). The stolons are up to 10 cm long and the few central flowering stems are up to 3.5 cm tall. The numerous basal leaves and the few stem leaves are linear to linear-oblanceolate, silky woolly-hairy, and 1 to 3 cm long. The flower heads are terminal with involucres of two types. The female involucres are 7- to 13-mm tall bracts that are tinged brown or reddish-brown, thinly woolly-hairy below. The male involucres are 4- to 7-mm tall translucent bracts that are brownish at the tips. The female flowers are 5 to 7 mm tall, whereas the male flowers are 3 to 4.5 mm tall. The achenes are elliptic, warty, and 2 to mm long with a 6- to 8-mm tall pappus that has white, hairlike bristles.

A. flagellaris is easily distinguished from other members of the genus in British Columbia by its conspicuous slender, leafless stolons. The species is easily overlooked, however, due to its small size and indistinct colour.

DISTRIBUTION

Global Range

A. flagellaris ranges from southwestern British Columbia, south in the western United States to Idaho, Wyoming, Nevada, and California (Cronquist 1994; Figure 2).

Canadian Range

In Canada, *A. flagellaris* is known only from a 3.2 km length of Highway 3 in the Similkameen River valley, south of Princeton in southwestern British Columbia (Douglas 1998; Douglas *et al.* 1998a, 2002a, b; Figure 3).

HABITAT

Habitat Requirements

A. flagellaris occurs in the southern interior of British Columbia along the Similkameen River valley in the

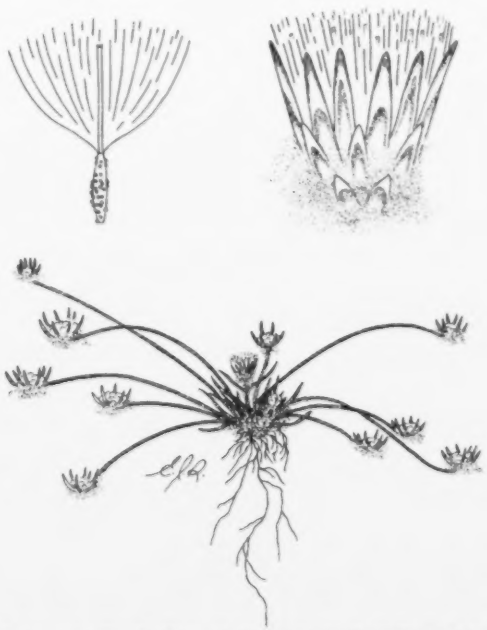

Figure 1. Illustration of *Antennaria flagellaris* (Line drawing by Elizabeth J. Steven in Douglas *et al.* 1998, 2002b).

[1] Taxonomy and nomenclature follows Douglas *et al.* (1998b, 1998c, 1999, 2001).

lower montane zone in the Interior Douglas-fir biogeoclimatic zone (Hope *et al.* 1991). Climatic conditions in this region are continental, characterized by hot, dry summers, a fairly long growing season and cool winters. A rainshadow effect prevails in this area due to the presence of the Coast-Cascade Mountains to the west.

Within this zone, *A. flagellaris* occurs in calcareous gravelly-clay soils or gravelly sands. Detailed soil mapping for the area indicates a complex of the Belfort, Lamont, and Roany soil series (Green and Lord 1979). Of particular interest is the Roany soil series, a till-derived soil type with a Solonetzic Dark Gray Chernozem classification. Pockets of bentonite (an absorptive and colloidal clay mineral) are a characteristic feature of the Roany soil series. The unusual soil moisture regimes of the *A. flagellaris* sites may be due to bentonite outcroppings or other soil characteristics. The Roany soil series also has high pH and salt crystals at depth.

The *A. flagellaris* sites are characterized by a unique hydrology. The slopes, which are moderate (20–30 percent) with open southerly aspects, are eroded, unstable, and characterized by ephemeral seepage. These moist microsites are saturated by underground water in the winter and dry up in the summer. The slow down-slope movement that occurs as a result of the unusual hydrology is unique in the region and excludes many taxa that are not able to tolerate the conditions. As a result, the slope is disturbed and sparsely vegetated, with *A. flagellaris* the dominant component. No non-native species occur in these sites.

Vegetation in the vicinity of the *A. flagellaris* sites is characterized by *Artemisia tridentata* (big sagebrush) shrub/grassland with scattered *Pinus ponderosa*

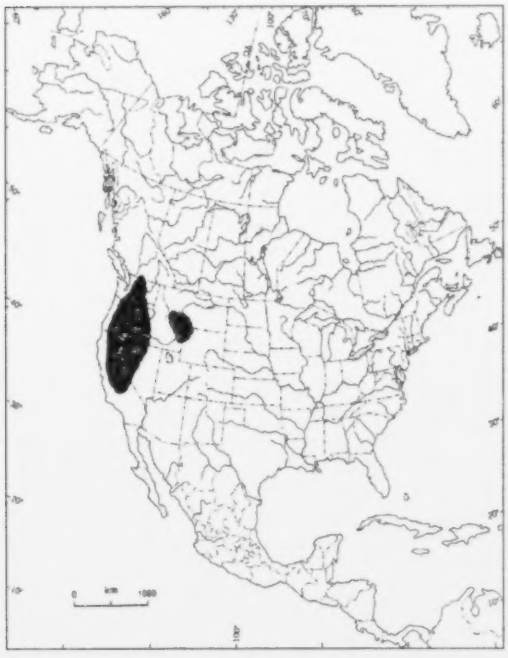

Figure 2. Distribution of *Antennaria flagellaris* in North America.

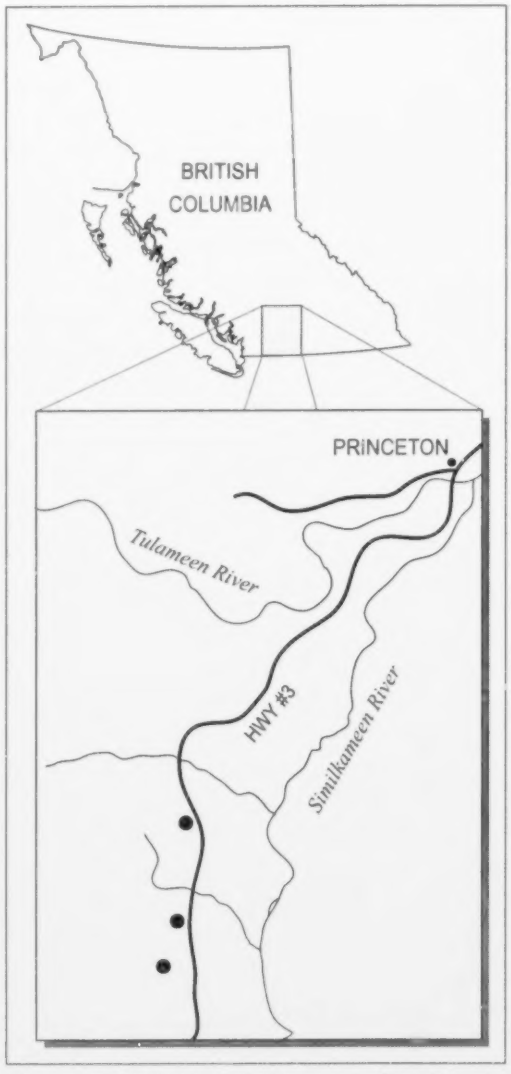

Figure 3. Distribution of *Antennaria flagellaris* in British columbia.

Table 1. Summary of populations and associated vascular plant species.

Population	Associated Vascular Plant Species (including community dominants and codominants)
Princeton, Watkins Lake, ca. 1.2 km WNW of the lake	*Ericameria nauseosus* var. *speciosa* and *Pseudotsuga menziesii*
Princeton, Tracey Lake, ca. 500 m NW of the lake	Unknown
Princeton, Stevenson Lake	1- *Arenaria capillaris*, *Danthonia unispicata*, and *Eriogonum heracleoides*. 2- *Eriogonum ovalifolium*, *Erigeron compositus* var. *glabratus* and *Arenaria capillaris* 3- *Arenaria capillaris*, and *Elymus trachycaulus*

(ponderosa pine) and *Pseudotsuga menziesii* (Douglas-fir). The sites occur at the western edge of the distribution of open shrub/grassland at that elevation.

In these sites, *A. flagellaris* occurs with *Eriogonum ovalifolium* var. *nivale* (cushion buckwheat), *E. heracleoides* var. *angustifolium* (parsnip-flowered buckwheat), *Lomatium ambiguum* (swale desert-parsley), *Arenaria capillaris* ssp. *americana* (thread-leaved sandwort), *Elymus trachycaulus* (slender wheatgrass), *Danthonia unispicata* (one-spike oatgrass), *Ericameria nauseosus var. speciosa* (common rabbit-brush), and *Erigeron compositus* var. *glabratus* (cut-leaved daisy). No non-native species were found in association with *A. flagellaris*.

Trends

Habitat trends are not available, but trends probably depend on the development activities at the sites. Residential or recreational development of the sites would probably reduce the extent of *A. flagellaris* habitat. Hydrological conditions are particularly important in maintaining the sites in an optimal state.

Protection/Ownership

The populations of *A. flagellaris* in British Columbia occur on two private properties.

BIOLOGY

General

Little information is available on the biology and ecology of *A. flagellaris* in British Columbia. Only basic reproductive facts have been compiled about the species.

Reproduction

A. flagellaris is a short-lived, dioecious (male and female structures on separate plants) perennial. This species produces seeds sexually by outcrossing (Bayer 1996). The fruits consist of single-seeded achenes.

Survival

Unknown.

Physiology

Unknown.

Movements/Dispersal

A. flagellaris is wind-pollinated. The numerous hair-like bristles of the mature achene facilitate its dispersal by wind. *A. flagellaris* also reproduces vegetatively by producing stolons that terminate in plantlets. Initially, the mother plant provides the plantlet with nutrients via the stolon. The genetically

Table 2. Locations and population sizes for *Antennaria flagellaris* in Princeton, British Columbia.

Collection site	Last observation	Collector	Number of plants / area (m^2)
Princeton, Watkins Lake, ca. 1.2 km WNW of the lake	1997	Lomer	50+ / 3 or 4
Princeton, Tracey Lake, ca. 500 m NW of the lake	1997	Lomer	unknown
Princeton, Stevenson Lake	2002	Douglas and Penny	1 400 000 ± 100 000 / 2100

identical plantlets eventually become independent plants as stolons are severed. This mode of reproduction results in very restricted dispersal, because stolons grow only to 10 cm long (Douglas 1998).

Nutrition and Interspecific Interactions

Unknown.

Behaviour/Adaptability

Unknown.

POPULATION SIZES AND TRENDS

Three recently surveyed populations of *A. flagellaris* occur in the Similkameen River valley, south of Princeton, British Columbia (Table 2). These populations occur over a distance of 3.2 km (Figure 3), cover areas of 3 or 4 m^2 to 2100 m^2, and contain from 50 to approximately 1 400 000 ± 100 000 plants. (Plant numbers for the latter count were made by extrapolating from exact counts in five 1-m^2 plots to the area covered.)

Short- and long-term trends for these populations are unknown but can be expected to vary markedly due to differences in yearly plantlet survival, seed germination, and seedling success. Conditions on the unstable, ephemerally moist clay slopes may vary drastically from year to year when abnormal climatic fluctuations affect the site hydrology. Because this species is dioecious, we can infer that 50 percent of the population is not seed-bearing, but for this species even these plants can reproduce asexually.

LIMITING FACTORS AND THREATS

The greatest threat to populations of *A. flagellaris* are road or housing developments. The southern interior of British Columbia has recently seen an increase in housing projects and the Princeton area is no exception. Any developments that even slightly change groundwater levels could be devastating to this taxon. Furthermore, suitable habitats for *A. flagellaris* are extremely restricted in Canada, only occurring in the Princeton area, thus the opportunities for colonization are extremely limited. Secondary threats include weed control measures and off-road vehicle use.

Although weeds are not a major threat to *A. flagellaris* populations, weed control activities do constitute a minor potential threat to populations. Under the *Weed Control Act,* an occupier must control noxious weeds growing or located on land and premises, thus marginally specific chemical weed control substances that kill broad-leaved plant species would probably kill *A. flagellaris*.

Recreational off-road vehicle use could also present a threat due to the nature of the steep, clay slopes where *A. flagellaris* occurs. When moist, this habitat would be highly susceptible to disturbance and at the same time, be at its most desirable to off-road users. Overuse of the habitat in this way could disturb the sites enough to radically alter the hydrological regime, and promote the establishment of non-native species

SPECIAL SIGNIFICANCE OF THE SPECIES

The calcareous clay seepage slopes occupied by *A. flagellaris* are unique in the Princeton area. In addition, they are not yet invaded by introduced species. Therefore, they represent important conservation areas in relatively pristine condition.

Furthermore, the populations of *A. flagellaris* are unique in that they are at the northern extent of their geographic range. Peripheral populations are often genetically and morphologically divergent from central populations and may have an evolutionary and ecological significance out of proportion to the percentage of the species they represent (Mayr 1982; Lesica and Allendorf 1995). The protection of genetically distinct peripheral populations may be important for the long-term survival of the species as a whole (Lesica and Allendorf 1995).

EXISTING PROTECTION OR OTHER STATUS

International Status

Globally, *A. flagellaris* has a rank of G5?, indicating that in most of its range the plant is "apparently common, demonstrably secure and essentially ineradicable under present conditions."

National and Provincial Status

Because the species is restricted to British Columbia, it has a national rank in Canada of N1. Provincially, *A. flagellaris* has been ranked by the Conservation Data Centre as S1 and appears on the British Columbia Ministry of Sustainable Resource Management red list (Douglas *et al.* 2002b). This is the most critical rank that can be applied to species at the provincial level and indicates that the species is "critically imperiled because of extreme rarity (typically five or fewer occurrences or very few remaining individuals) or because of some factor(s) making it especially vulnerable to extirpation or extinction."

Currently no specific endangered species legislation is in place to protect vascular plants in British Columbia that have been given this critical rank. The populations of *A. flagellaris* in British Columbia, however, may be afforded some protection against certain types of property development because they occur on two private properties that fall within the Agricultural Land Reserve. In these lands, agriculture is recognized as the primary land use, but conversion to intensive uses is not prohibited and could be incompatible with the habitat requirements of *A. flagellaris*. The Agricultural Land Reserve status also subjects the properties to the *Soil Conservation Act of British Columbia*, which prohibits removing soil or placing fill on land in the Agricultural Land Reserve, except with permission from the Provincial Agricultural Land Commission. As a result, in the absence of active stewardship, populations of rare plants on these private lands are not secure.

SUMMARY OF STATUS REPORT

1. Only three extant populations, along a 3.2-km stretch of Highway 3 south of Princeton, are known in British Columbia.
2. Suitable habitats for *A. flagellaris* are extremely rare in Canada and are restricted to the Princeton area, thus opportunities for colonization are extremely limited.
3. Road-building, housing developments, and recreational off-road vehicle use threaten the continued persistence of this species in Canada; weed control activities could also inadvertently destroy *A. flagellaris*.
4. The populations of *A. flagellaris* occur on private lands; in the absence of active stewardship, such populations of rare plants are not secure.
5. The populations of *A. flagellaris* in British Columbia are at the northern extent of their range and may represent populations that are genetically distinct and important for the long-term survival and evolution of the species. A significant loss of Canada's genetic resources could occur if these peripheral populations are not protected.

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COLLECTIONS EXAMINED

Herbarium specimens housed at the Royal British Columbia Museum in Victoria (V) were viewed and verified.